An Independent Assessment of Year 2000 Readiness of the Four Major Freight Railroads in the United States

Performed by

through Anteon Corporation
for the

Federal Railroad Administration

Department of Transportation

October 8, 1999

FOREWORD

This project was performed by CACI International, a sub-contractor to Anteon Corporation, as a task on the ITOP II contract of the Department of Transportation. The contract number is DTTS59-99-D-00442. The task order number is 919002-TO-01.

ACKNOWLEDGEMENTS

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1 EXECUTIVE SUMMARY

On behalf of the Federal Railroad Administration (FRA), CACI performed an independent Year 2000 readiness assessment of America's four largest freight railroads: Burlington Northern Santa Fe, CSX, Norfolk Southern, and Union Pacific. Combined, these four railroads move freight throughout the entire country and account for over 86 percent of the revenue of the American railroad industry as a whole. Conducted from August 29, 1999 to October 8, 1999, the assessment was done to provide the FRA and its parent, the U.S. Department of Transportation, with an independent view of the Year 2000 readiness of the railroad industry. The purpose was also to make recommendations, as appropriate, that would assist each railroad in achieving Year 2000 compliance by the end of the year and exercising due diligence in the remaining months of their respective compliance programs.

In summary, the assessment concludes that these four large railroads are ready for Year 2000.

All four companies had well managed, well funded Year 2000 compliance programs that were initiated four to five years ago, giving them an early start on a large, complex undertaking. The computer and telecommunication systems and electronic data interchanges critical to railroad operations of all four railroads were rigorously and comprehensively inventoried, their software code remediated, then thoroughly tested, simulating all the commonly prescribed Year 2000 dates used for system validation. Combined, the four railroads inventoried and assessed systems comprising over 200 million lines of software code. Moreover, the remediated critical transportation support systems that were the focus of this assessment were put back into operational use at least several months ago, and for some railroads, over a year ago, clearly demonstrating that these systems continue to support railroad operations just as well as they did before their remediation.

As to the scope of the review, only those systems that more or less directly affect the operation of railroad transportation were assessed. Examples of such systems are those that manage car/trailer distribution, locomotive distribution, operations planning, bill of lading receipt and handling, operating waybill creation and exchange, yard management, crew calling, and dispatching.

CACI applied its standard Year 2000 methodology in reviewing all four railroads. The methodology included the use of a standard interview checklist divided into eight major risk areas. These were: a) Management and Project Planning, b) Information Systems, c) Telecommunications, d) Data Exchange, e) Supply Chain, f) Testing and Validation, g) Documentation, and h) Risk Management and Contingency Planning.

On a 100-point scale, the composite 8-category scores for the four large railroads ranged from 97.1 to 97.9, falling well within the very low risk category.

Given a degree of subjectivity inherent in the evaluation of the evidence presented by each railroad, the scores all falling within a one-percentage-point range must be interpreted as essentially equal, and all very high. The higher the score, the lower the assessed risk. For quantitative scoring, each risk area was equally weighted, as was each question within a risk area. There were ten questions per risk area, hence requiring each railroad to answer 80 questions and providing supporting evidence for their answers. 100 points were possible for each risk area.

At FRA's request the two areas not covered, and thus outside the scope of this review, were a) Legal Implications and b) Facilities and Embedded Technology. As to embedded software in facilities or equipment, the railroads and railroad suppliers had previously declared that the embedded chips that make up part of the equipment used to control train crossings and track switching depend on detection of events (such as a train reaching a certain distance from a crossing), and not on dates, to operate normally. Thus, there was never a safety risk from date sensitivity in the critical areas of grade crossings and track switches.

A three-person CACI team performed the process-oriented assessment of each railroad in a predetermined time (7-9 days). The assessment results depended entirely upon the information that the review team was able to gather from the railroad during the course of the review period through structured interviews using the CACI standard checklist of questions and through review of the railroads' Year 2000 program documentation, e.g., project plans, project status reports, contingency plans, test plans, test results, vendor product certification letters.

In every case, a railroad's Year 2000 contingency plans and help desk procedures are modeled after its current, relatively robust (and tested through years of use) disaster recovery plans and existing help desk procedures. They have been enhanced to encompass special Year 2000 issues for the critical period of December 31, 1999, through January 31, 2000.

In addition to the necessarily heavy involvement of the information systems departments of each railroad, each company had strong and sustained support and involvement of its executive management team and division heads and their respective staffs. These were company-wide initiatives with corporate-wide responsibility facilitated by information systems department leadership and central coordination.

Each railroad used multiple types of media to maintain totally open communications about the status and direction of their respective Year 2000 programs, targeting their employees, their business partners, their suppliers and customers. These included newsletters, toll-free hotlines, regular updates to status posted on their Internet web sites, participation in public forums, and open invitations for any electronic commerce trading partner to test with them.

In conclusion, no organizations whose operations depend as heavily on computers and software as the railroad industry can be absolutely sure there will be no date-related glitches that escaped remediation. Nonetheless, this independent assessment of the due diligence

followed by all four of America's largest railroads indicates the American public and all organizations who ship their goods over the rails should expect no degradation of service caused by year 2000 problems.

As of the date of this report, all railroads are continuing their Year 2000 program across the millennium. For the final quarter of 1999, the four major freight railroads are concentrating their efforts on end-to-end testing for additional self-assurance and contingency planning to further minimize risk. In this report and in the railroad-specific assessment reports delivered earlier to each company, the review team encouraged the companies and their Year 2000 project teams to maintain the strong management due diligence they have exercised to date in completing the tasks that remain. These tasks fall primarily into the areas of a) additional (and in many cases, redundant) end-to-end testing, b) testing data interchange with additional suppliers and customers, and c) contingency planning. In each case, the individual railroad is further tightening up what has already been assessed as falling into the *very low risk* area. This is the kind of discipline that can find and eliminate any bugs that may remain and prepare the companies to react effectively and rapidly should any bugs appear.

2 INTRODUCTION

2.1 PURPOSE

From August 29, 1999, to October 1, 1999, CACI conducted a Year 2000 Readiness Review of the four major American freight railroads: CSX Transportation, Norfolk Southern, Union Pacific, and Burlington Northern Santa Fe. Included was a separate assessment of the Conrail (Shared Assets), which are jointly owned and managed by CSX Transportation and Norfolk Southern. In addition, a site visit was made to RAILINC and interviews were conducted to gain a better understanding of its role as a data interchange facilitator in the railroad industry. CACI did not formally assess the operations and systems of RAILINC, an organization wholly owned by the American Association of Railroads (AAR).

The Year 2000 readiness assessment was requested and sponsored by the Federal Railroad Administration. The assessment was intended to provide FRA and, in turn, the American public and railroad customers, with an objective determination of the readiness of the four largest U.S. railroads to conduct transportation operations effectively and efficiently in the Year 2000. The purpose was also to make recommendations, as appropriate, that would assist each railroad in achieving Year 2000 compliance by the end of the year and exercising due diligence in the remaining months of their respective compliance programs. Finally, the assessment was to highlight particularly effective aspects (i.e., key positives) of each railroad's Year 2000 program so that they could be shared across the railroad community as "Best Practices."

2.2 SCOPE AND LIMITATIONS

Scope is addressed from two standpoints, Risk Area and Type of System. Risk Area scope refers to the CACI Standard Year 2000 Assessment Methodology that addresses 10 risk areas. The scope of this assessment included eight of the ten risk areas. The eight areas are:

a. Management and Project Planning
b. Information Systems
c. Telecommunications
d. Data Exchange
e. Supply Chain
f. Documentation
g. Testing and Validation
h. Risk Management and Contingency Planning

At FRA's request, the two areas not covered, and thus outside the scope of this assessment, were a) Legal Implications, and b) Facilities and Embedded Technology. Each risk area is defined in Table 2.1, below.

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Table 2-1 Risk Area Descriptions

No.	Risk Area	Description
1	**Management & Planning**	This risk area addresses whether the railroad has followed acceptable methods/practices in the overall management and planning of its Year 2000 compliance program.
2	**Facilities and Embedded Technology**	This risk area addresses whether the railroad has followed acceptable methods/practices in the assessment, renovation, testing, and implementation of facilities and embedded technologies as they apply to this area. **At FRA's request this risk area was not assessed.**
3	**Telecommunications**	This risk area addresses whether the railroad has followed acceptable methods/practices in the assessment, renovation, testing and implementation of telecommunications systems as they apply to this area.
4	**Supply Chain**	This risk area addresses whether the railroad has followed acceptable methods/practices for ensuring that the suppliers of the goods and services upon which this area depends are Year 2000 compliant.
5	**Data Exchange**	This risk area addresses whether the railroad has followed acceptable methods/practices for assessing, renovating, testing, validating and implementing external/internal data exchange arrangements, systems and procedures as they apply to this area.
6	**Information Systems**	This risk area addresses whether the railroad has followed acceptable methods/practices in the assessment, renovation, testing, validation and implementation of information systems as they apply to this area.
7	**Testing & Validation**	This risk area addresses whether the railroad has followed acceptable methods/practices for ensuring that testing and validation strategies, plans and activities are sufficiently comprehensive to identify all significant instances of non-Year 2000 compliance.
8	**Legal Implications**	This risk area addresses whether the railroad is aware of the legal issues/risks associated with failure to achieve Year 2000 compliance and has taken appropriate measures to address them. **At FRA's request this risk area was not assessed.**
9	**Documentation**	This risk area addresses whether the railroad has followed acceptable methods/practices for the formal, systematic and comprehensive documentation of Year 2000, compliance program.
10	**Risk Management & Contingency Planning**	This risk area addresses whether the railroad has followed acceptable methods/practices in the preparation and testing of the contingency plans that would be put into effect should Year 2000 compliance not be achieved.

Five of the ten risk areas—Information Systems, Facilities and Embedded Technology, Telecommunications, Supply Chain, and Data Exchange—address responsibilities the

railroads may be reporting either to regulatory agencies, customers or suppliers. The remaining five risk areas—Management and Project Planning, Testing and Validation, Legal Implications, Documentation, and Risk Management and Contingency Planning—relate to the processes being used by the railroad to achieve Year 2000 compliance and to actions that must be taken should those efforts prove unsuccessful.

As to type-of-system scope, only those systems that more or less directly affect the operation of railroad transportation were of interest. Examples of these kinds of systems are those needed to manage car/trailer distribution, locomotive distribution, operations planning, bill of lading receipt and handling, operating waybill creation and exchange, yard management, crew calling, and dispatching.

The assessment was performed within a predetermined time that included spending seven to nine days on site with the Year 2000 project team of each railroad. The accuracy and completeness of the assessment depended entirely on the information that the review team was able to gather from the railroad during the course of the assessment period through structured interviews using the CACI standard checklist of questions and through review of supporting documentation requested by CACI and provided by the railroads. The assessment was process-oriented. Though process-oriented, the review team examined thousands of pages of documents which represented substantive evidence of the relative rigor and comprehensiveness of the processes in place.

2.3 APPROACH

The assessment was accomplished by two three-person teams. One team assessed Norfolk Southern, CSX and Conrail (Shared Assets) while the other team assessed Union Pacific and Burlington Northern Santa Fe. This review was conducted through a series of interviews with key members of each railroad's management and staff and through a review of documentation associated with the railroad's Year 2000 compliance efforts. The basis for both the personnel interviews and the documentation review was the CACI Year 2000 Readiness Review Checklist.

Each of the previously identified risk areas addressed by the checklist was scored on a scale of 0 - 100. Each railroad, in turn, was given an overall score on a scale of 0 - 100, reflecting the average of the scores received for each risk area. The review team delivered a separate report to the management of each railroad on the last day of the onsite assessment period, and out-briefed the railroad's Year 2000 management team. The railroad-specific reports documented the assessed status of its Year 2000 effort, key positives or "Best Practices", and any findings and associated recommendations. At the completion of all site visits the teams then analyzed and summarized the reports from each railroad to produce this overall railroad Year 2000 Readiness Report for the FRA.

The objective of the Year 2000 Readiness Review was to determine, for each risk item within each risk area, if the railroad fully addressed that risk item. If the railroad did not fully

address the risk item, the CACI review team attempted to identify the potential impact on the schedule and quality of the railroad's readiness effort.

2.4 RAILROAD SPECIFIC CONSTRAINTS

There were no constraints encountered during the review of the railroads. Within the CACI defined approach, the railroads were fully cooperative.

2.5 SCORING METHODOLOGY

CACI uses a quantitative scoring method to analyze and express the extent to which the railroads are at risk in various aspects of their readiness programs. Each risk area is assigned a score from 0 to 100, which is the sum of the scores of the ten review items for that risk area. (Scores for review items range from 0 to 10). All risk areas and each question for a given risk area are weighted equivalently. An average score for all risk areas is also computed. The significance of the average score is as follows:

1. If the **AVERAGE SCORE** is **90 or above,** the railroad under review is considered to be at **very low risk**.

2. If the **AVERAGE SCORE** is **between 80 and 89,** the railroad under review is considered to be at **low risk**.

3. If the **AVERAGE SCORE** is **between 70 and 79,** the railroad under review is considered to be at **moderate risk**.

4. If the **AVERAGE SCORE** is **between 60 and 69,** the railroad under review is considered to be at **medium risk**.

5. If the **AVERAGE SCORE** is **between 50 and 59,** the railroad under review is considered to be at **high risk**.

6. If the **AVERAGE SCORE** is **between 30 and 49**, the railroad under review is considered to be at **very high risk**.

7. If the **AVERAGE SCORE** is **between 10 and 29**, the railroad under review is considered to be at **extreme risk**.

8. If the **AVERAGE SCORE** is **between 0 and 9**, the railroad under review is considered to be **not compliant**.

At FRA's request Legal Implications and Facilities and Embedded Technology risk areas were not included in this review. In keeping with CACI's scoring methodology a score of 100 was assigned to each and averaged in the final score.

3 OVERVIEW OF CORPORATE ENTITIES ASSESSED

This section provides background on each of the railroads assessed as well as a brief synopsis of RAILINC. It is included as background information only to give the reader an appreciation for the nature of these large complex enterprises and the size and reach of their transportation operations. It also provides a summary view of the magnitude of the Year 2000 compliance challenge faced by each railroad.

3.1 CSX

3.1.1 Overview

CSX Transportation, headquartered in Jacksonville Florida, is a unit of CSX Corporation, a family of international transportation companies. CSX was formed on November. 1, 1980, by the merger of two major eastern railroads: Chessie System and Seaboard Coast Line. Chessie's predecessors include the nation's first railroad, the Baltimore & Ohio, as well as the Chesapeake and Ohio Railway and Western Maryland Railway. Seaboard's predecessors include Atlantic Coast Line, Seaboard Air Line and Louisville & Nashville. The merged railroads began operating as CSX Transportation Inc. in 1986.

Transportation is the principal business of CSX. It is an international transportation company with interests in rail, container-shipping, intermodal, trucking, and barge and contract logistics services.

CSX, is one of two large railroads east of the Mississippi River, and provides rail transportation and distribution services with over 23,000 route miles and 31,961 track miles in 23 states, the District of Columbia, and Ontario, Canada. CSX has over 10,000 customers and approximately 34,000 employees. In 1998, CSX rail operating revenue was $4.9 billion. Major commodities transported by CSX include coal, chemicals, automobiles, minerals, agricultural products, food and consumer goods, metals, forest and paper products, and phosphates and fertilizers.

On June 1, 1998, CSX acquired 42% of Conrail assets. The acquisition resulted in the formation of a new CSX Transportation. The new CSX has projected annual revenues at $6.4 billion.

3.1.2 Year 2000 Program Challenge

CSX began its Year 2000 program in 1996, using what it calls the five-ring approach. CSX divided its Year 2000 Program into the following five areas: Core Systems, Distributed Systems, Embedded Systems, E-Commerce, and Trading Partners. CSX inventoried,

analyzed, remediated or replaced, tested, and implemented more than 62 million lines of code on three mainframes and multiple client server boxes. CSX estimates a budget of approximately $56 million was expended on its Year 2000 effort.

3.2 NORFOLK SOUTHERN

3.2.1 Overview

Norfolk Southern is a Virginia-based holding company with headquarters in Norfolk. It owns a major freight railroad, Norfolk Southern Railway Company and a natural resources company, Pocahontas Land Corporation.

Norfolk Southern was formed June 1, 1982, with the consolidation of Norfolk and Western Railway and Southern Railway. On June 1, 1999, Norfolk Southern began operation on the 58% of Conrail it acquired expanding its reach into the Northeast.

Norfolk Southern's principal transportation operating revenue sources are coal; paper and forest products; agricultural products; chemicals; automotive parts and finished vehicles; metals and construction materials, and intermodal trailers and containers. In 1998, Norfolk Southern rail operating revenue was $4.2 billion. Projected revenue for the combined properties is approximately $6 billion.

Norfolk Southern employs more than 35,000 people. Its rail operations form a single system of some 21,600 miles of road in 22 states located in the East, the District of Columbia, and the Province of Ontario, Canada.

3.2.2 Year 2000 Program Challenge

Norfolk Southern (NS) began its Year 2000 effort in October 1995. The initial focus was on the assessment, remediation, unit testing, and implementation of its mainframe systems. Norfolk Southern accomplished this tremendous effort (approximately 20,000 programs) in 1997. In 1998, Norfolk Southern expanded its Year 2000 Program to include its Enterprise-wide systems.

Norfolk Southern, realizing the magnitude of this effort, established a Y2K Program Management Office in June 1998 to address these issues. All items that could have any potential Y2K impact were inventoried into seven categories: hardware, shrink-wrapped software (COTS), operating systems, in-house developed applications, mainframe retrievals, embedded processors, and suppliers and affiliates.

The resulting enterprise inventory was completed in July 1998. The approximate number of items inventoried was 40,000, which includes, at an application level, the mainframe programs that were previously remediated in 1997. Norfolk Southern inventoried, analyzed,

remediated or replaced, tested, and implemented 30 million lines of code. Their Y2K project budget was set at $30 million.

3.3 UNION PACIFIC

3.3.1 Overview

Union Pacific Corporation is headquartered in Omaha, Nebraska. Union Pacific Corporation is comprised of three operating companies: Union Pacific Railroad, Overnite Transportation, and Union Pacific Technologies. Union Pacific Railroad, with the acquisition of the Missouri Pacific and Western Pacific Railroads in 1982, the MKT Railroad in 1988, the Chicago and North Western in 1995, and the Southern Pacific in 1996, covers the western two thirds of the United States linking every West Coast and Gulf Coast port. It also serves four major gateways to the east: Chicago, St. Louis, Memphis, and New Orleans. Union Pacific is the primary rail connection between the U.S. and Mexico and interchanges traffic with the Canadian Rail System. Union Pacific runs 155,308 freight cars and 6,913 locomotives.

Transportation is the principal business of Union Pacific Railroad. Union Pacific is the largest railroad in North America and provides rail transportation and distribution services with over 33,700 route miles in 23 states. Union Pacific has approximately 53,000 employees. In 1998 Union Pacific rail operating revenue was $9.3 billion. Union Pacific transports coal, chemicals, automobiles, agriculture products, food, metals, and forest and paper products for its shippers and customers. Union Pacific is the largest intermodal carrier and transporter of chemicals.

3.3.2 Year 2000 Program Challenge

Union Pacific began its Year 2000 program in 1995 and divided it into six sub-projects: Mainframe Systems, Client Server Systems, User Department Developed Systems, Vendor Supplied Software, Hardware and Embedded Systems, Electronic Commerce and EDI (Electronic Data Interchange) Systems and Year 2000 Contingency Plans.

With a budget of approximately $46 million, Union Pacific inventoried, analyzed, remediated or replaced, tested, and implemented more than 72 million lines of code on six mainframes and eight million lines of code on 800 client server boxes.

3.4 BURLINGTON NORTHERN SANTA FE

3.4.1 Overview

Burlington Northern Santa Fe Corporation (BNSF), headquartered in Ft. Worth, Texas, was created on September 22, 1995, with the merger of Burlington Northern Inc. (parent

company of Burlington Northern Railway) and Santa Fe Pacific Corporation (parent company of the Atchison, Topeka and the Santa Fe Railway). BNSF covers the western two-thirds of the United States utilizing 90,000 freight cars and 5,000 locomotives.

Transportation is the principal business of BNSF. They are the largest transporter of low-sulfur coal, grain, beer, aluminum, and aircraft parts. BNSF is one of the two large railroads west of the Mississippi River and provides rail transportation and distribution services with over 32,000 route miles in 28 states and two Canadian provinces. BNSF has approximately 44,500 employees with a 1998 operating revenue of $8.9 billion. BNSF transports coal, chemicals, automobiles, agriculture products, food, metals, and forest and paper products for more than 30,000 shippers and customers.

3.4.2 Year 2000 Challenge

BNSF began its Year 2000 program in 1997 after systems were consolidated as a result of the 1995 merger between Burlington Northern and Santa Fe. Core systems that were largely Y2K compliant were selected from each railroad for continued use.

With a budget of approximately $20 million, BNSF inventoried, analyzed, remediated or replaced, tested, and implemented more than 33 million lines of code on seven mainframes and over 400 client server boxes.

3.5 RAILINC

3.5.1 Overview

RAILINC is a provider of information technology development and related services to the North American railroad industry. RAILINC is a stand-alone, for-profit corporation (a wholly owned subsidiary of the Association of American Railroads), with headquarters in Cary, North Carolina.

RAILINC operates EDI networks for document exchange. Currently over 2.3 million EDI messages per day are switched between trading partners. RAILINC also maintains an extensive database of rail transportation information. This information is accessed daily by various members of the rail industry via an existing dedicated network or by use of the Internet.

RAILINC provides a variety of central system services for the North American rail industry, including railroads, rail equipment owners, other rail suppliers, rail customers, and others. Following is a list of some of the systems that RAILINC uses in its support of the railroad industry:

- UMLER
- Car Repair Billing (CRB)
- Data Exchange
- Deprescription/CHARM
- Rate EDI Network
- Price Data Base (PRDB)
- National Rate Master System (NRMS)
- Forward & Store (F&S)
- Industry Reference Files (IRFs)
- TRAIN II/ISM
- Interline Settlement System (ISS)

4 SUMMARY OF ASSESSMENT RESULTS

This section presents the overall assessment with scoring summary, the more significant key positives or best practices, findings, and recommendations.

4.1 OVERALL ASSESSMENT

As an industry the railroads took early initiatives to tackle the Y2K problem. Beginning as early as 1995, they began preparing for the Year 2000. As they reviewed existing systems, they made decisions on technical approaches, which would minimize the impact of Y2K. In 1997, most railroads began inventorying their computer and telecommunications systems. In 1998, all were engaged in assessing, remediating, and testing these systems. As of September 30, 1999, all have reported their critical systems as Y2K ready. The railroads continue to conduct end-to-end testing with vendors and customers.

The railroads made remediation of their transportation systems, all of which reside on mainframes, their first priority. All had assessed, remediated, and tested these mainframe applications by September 1999. Although some of the railroads first considered field date expansion from a two-digit year to a four-digit year as an approach early in their Y2K efforts, all eventually applied the windowing technique for remediating their systems/applications. In simple terms windowing is a solution that enables applications to refer to dates within a 100 year period without any ambiguity. A 100-year period is identified in which these dates are the only ones accessible to the applications. The systems continues to express year value as two digits. All two-digit values represent a date in this time window.

While the railroads have put halts to additional changes in their transportation systems, the dates and periods for stabilizing these changes vary. For the final quarter of 1999, the four major freight railroads are concentrating their efforts on end-to-end testing for additional self-assurance and contingency planning to further minimize risks. Final testing with complete documentation involves review by internal auditors or review boards and senior managers.

The railroads involved their information systems departments and business groups in their Y2K remediation program. While some had an integrated approach, others clearly delineated between the two groups; however, all railroads did have one accountable executive, the chief information officer or an equivalent. The railroads recognized the importance of getting all employees on board. Employee awareness programs, including technical staff and applications users, placed emphasis on employees taking ownership of their areas of responsibilities.

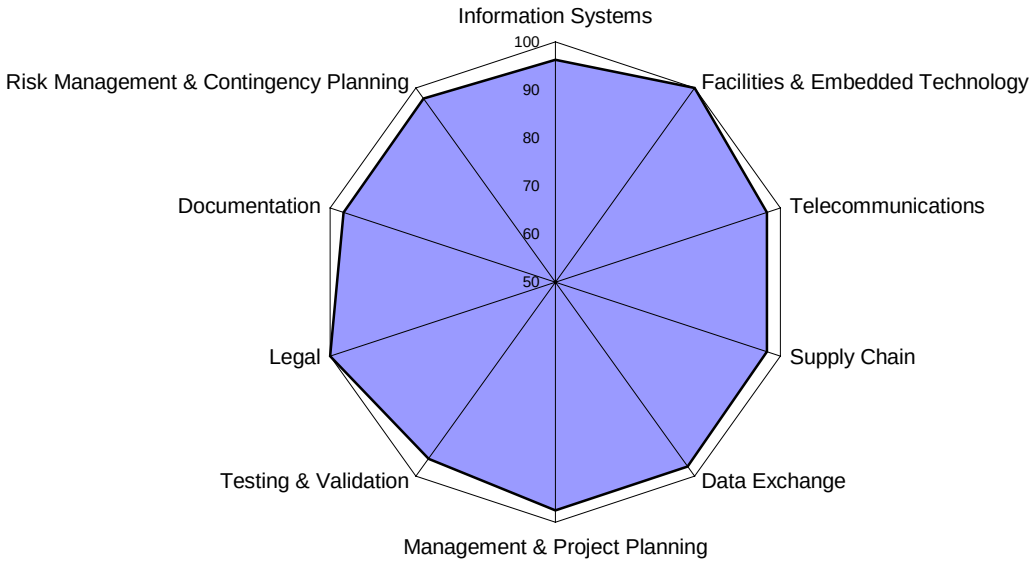
Table 4-1 below displays a summary of the average four railroad scores for each risk category and an overall composite score. Not only is the composite score very high and well within the very low risk category, the range of scores across all four railroads is within one percent.

Table 4-1 Scoring Summary

No.	Risk Area	Average 4-Railroad Score	Range of Scores
1	Management & Planning	97.5	96 - 100
2	Facilities and Embedded Technology	100	100 - 100
3	Telecommunications	97.25	93 - 100
4	Supply Chain	97	94 - 100
5	Data Exchange	97.5	97 - 98
6	Information Systems	96.25	94 - 98
7	Testing & Validation	95.5	94 - 97
8	Legal Implications	100	100 - 100
9	Documentation	97	95 - 99
10	Risk Management & Contingency Planning	97.25	96 - 98
	Composite Average Score	97.5	93 - 100

Figure 4-1 shows a different graphical view of these results in a polar chart. This is the kind of graphical portrayal of results that was included in each of the railroad-specific reports given only to the companies that were formally assessed.

Figure 4-1 Railroad Polar Chart



Railroad Risk Rating: *97.5*

Key

90 – 100	Very Low Risk
80 – 89	Low Risk
70 – 79	Moderate Risk
60 – 69	Medium Risk
50 – 59	High Risk
30 - 49	Very High Risk
10 - 29	Extreme Risk
0 - 9	Non-Compliant

4.2 KEY POSITIVES, FINDINGS, AND RECOMMENDATIONS

Following are the key positives relative to the railroads' Year 2000 compliance efforts, which the review team considers worthy of note and communication to others as "Best Practices." This section also includes findings resulting from the review and recommendations specific to those findings. A finding is an issue discovered during the review process that may be considered a risk.

4.2.1 Management and Project Planning

The overall management and project planning for the Y2K compliance program at each of the railroads recognized the urgency of Y2K as early as 1995. The railroads established charters with appropriate standards, appointed accountable executives, created plans, endorsed employee training, monitored progress, and developed awareness programs. Each railroad addressed the Y2K problem as an enterprise problem, involving employees across the board and encouraging employees to take ownership of their particular responsibilities. The multimillion-dollar budgets the railroads allocated for Y2K show the seriousness with which management approached the problem. An impressive aspect of the management approach was the heavy reliance on state of the art technology. All of the railroads relied upon the Internet, the Intranet, office systems such as Lotus Notes and Microsoft Project, and aging and date simulation tools.

The average score for Management and Project Planning was 97.5. The high score was 100. The low score was 96.

Key Positive: Rigorous Inventory and Assessment of Software and Hardware
Each railroad emphasized performing a thorough inventory of transportation systems software and hardware. Each railroad used multiple automated inventory and assessment tools. Each also performed comprehensive visual checks of software and source code or sampled sufficient code to verify the effectiveness of the selected automated tools. Their robust inventories and assessments resulted in high confidence that all software critical to railroad operations has been identified and subsequently remediated.

Key Positive: Information Available on the Internet
Management of the railroads encouraged the use of the Internet to accomplish project management goals and to inform external parties of the companies' policies. The Internet enabled the railroads to keep customers and vendors informed of railroad related Y2K issues. All of the railroads use the Internet as part of their awareness programs and to communicate the status of their Y2K compliance activities. The railroads use the Internet to send letters outlining Y2K requirements to vendors and customers, send information on upgrading EDI transactions, and to disclose the railroads' own Y2K readiness. The railroads also hold on-line workshops, conferences, and meetings with suppliers, customers, shortlines, other railroads, and public agencies.

Key Positive: Employee Information, Awareness, and Training on Intranets
As part of their project management, the railroads have relied heavily on their own Intranets for providing information to their employees. The Intranets are used to foster Y2K awareness as well as to provide instruction in particular areas. Employees can find inventories, test scripts, documentation standards, compliance status of Commercial of the Shelf (COTS) software and hardware, deadlines and Y2K progress to date, and training programs on their Intranets.

Key Positive: Legal and Auditing Department Participation
The railroads consulted with their legal and auditing departments to manage Y2K efforts. Legal departments provided language for business documents incorporating Y2K compliance statements and provided guidelines for documentation standards and retention. Audit departments assisted with supplier certification and performed reviews for completeness and compliance.

Finding: Current Overall and Centralized Project Plans Needed
Although the railroads had project plans with established milestones and reported accomplishing those milestones, not all of them kept accurate, updated comprehensive plans. In some instances, work groups maintained plans. In other instances, individuals maintained plans.

Recommendation:
Each railroad needs to assign an individual to monitor and maintain the overall project management plan and reports for any additional Y2K work.

4.2.2 Telecommunications

The railroads completed inventories of all common components, including voice and data equipment and supporting software and protocols. They also prioritized the inventory for renovation, conducted requirement analysis, and developed strategies for retiring telecommunications systems, implemented new ones or upgraded existing systems, created test plans, and performed post implementation review.

The average score for telecommunications was 97.25. The high score was 100. The low score was 93.

Key Positive: Rigorous Testing
Telecommunications testing was particularly rigorous. All of the companies required vendor testing and certification; some of them duplicated the vendor testing; others went beyond vendor testing and actually developed their own testing strategy.

Finding: Telecommunications Treated as Separate Entity
Although the railroads followed acceptable methods and processes in assessment, remediation, testing, and implementation of their telecommunications systems, some of the railroads addressed telecommunications as a separate entity with less emphasis on overall planning and management.

Recommendation:
For any new or additional work, the railroads should have formal project plans with milestones and detailed work breakdown structures for telecommunications rolled into the overall Y2K project plan.

4.2.3 Supply Chain

The railroads have followed acceptable procedures for ensuring vendors who supply goods and services are Y2K compliant. Some railroads centralized the responsibility for vendor compliance under one officer; others decentralized the responsibility by departments and/or product owners. Most railroads have required critical vendors to be Y2K compliant and have tested with those vendors.

The average score for supply chain was 97. The high score was 100. The low score was 94.

Key Positive: Defined Y2K Compliance for Vendors
All railroads have defined compliance issues for their vendors and asked for compliance certification via letters, telephone follow-up, and the Internet.

Key Positive: Backup for Critical Supplies
The railroads have identified backup sources for critical supplies, such as diesel fuel, power, and telecommunications.

Finding: Vendor Certification Incomplete
Not all railroads have completed vendor certification. Nor have the railroads re-contacted all vendors previously certified as compliant to ensure continued compliance.

Recommendation:
Railroads should continue testing with suppliers during the fourth quarter and follow up with previously certified compliant vendors to ensure continued compliance. The railroads should address non-compliant vendors in their contingency plans.

4.2.4 Data Exchange

The railroads maintain inventories of their customers and of data imported and exported. The railroad industry completed a prioritized list of critical EDI transaction sets consisting of:

- 404 Bill of Lading
- 417 Operating Waybill
- 418 Advanced Consist
- 419/420 Request for Response with blocking instructions
- 421 Trip Plan
- 425/427 Request for Response with Waybill

Offering to test EDI with customers, the railroads have contacted their customers in multiple ways. They have made offers by written letters, telephone, and the Internet. Marketing departments have made personal calls and presentations to major revenue producing customers.

The average score for Electronic Data Exchange was 97.5. The high score was 98. The low score was 97.

Key Positive: Y2K Compliance Assistance to Customers
The railroads have used the Internet to post their own Y2K readiness disclosures and to offer compliant formats and procedures for upgrading.

Key Positive: Transaction Set, 4010 Implemented in 1998
A four-digit Transaction Set, 4010 Version (Y2K compliant), was implemented by the railroads in late 1998. The code is currently static, and no new EDI standards are planned.

Key Positive: Alternative Backup for Data Exchange
The railroads have alternative means of exchanging data with those customers who are not Y2K compliant. They are able to handle data in any format. Some recommend customers use third parties to convert and transmit data. All have FAX capability.

Finding: Customer Testing Incomplete
Not all railroads have completed customer testing.

Recommendation:
The railroads should make customer testing an immediate priority and complete customer testing in the fourth quarter of 1999. All railroads should continue to test exchanges with RAILINC 's Forward and Store system for all critical EDI messages.

4.2.5 Information Systems

Following formal acceptable methods and practices in assessment, remediation, testing, validation and implementation, the railroads across the board, conducted thorough application and platform inventories, established implementation schedules and completed analysis and design requirements. In performing the actual remediation, the railroads tested source code, procured necessary new hardware and software, retired systems, performed data conversion where needed, developed test strategies, required certification testing, documented renovated systems, and ensured configuration management for all new and remediated systems. Most used acceptable configuration management processes and tools, such as ChangeMan, Natural Move, and PVCS. The railroads followed their corporate configuration management guidelines and practices.

The average score for information systems was 96.25. The high score was 98. The low score was 94.

Key Positive: Early Completion of Critical Transportation Systems
All four major freight railroads have completed remediation of their mainframe transportation control systems and have the remediated systems in operation.

Finding: Variations in Configuration Management
The range of formality in configuration management was wide and the tools varied. Most of the railroads followed configuration management processes that had been in place for many years.

Recommendation:
The railroads need to follow acceptable formal configuration management procedures for any additional changes on all mainframe or distributed systems.

4.2.6 Testing and Validation

Following comprehensive testing and validation strategies, the railroads identified all significant instances of non-Y2K compliance. The railroads tested and validated all elements that supported critical activities, Following formal test plans, strategies, and scripts, the railroads tested contractor-remediated systems, vendor products, internal and external systems, including mainframe, client server and personal computer systems. Individual railroads have conducted end-to-end testing of the 4010 Transaction Set with RAILINC, other railroads, shortlines, and customers.

The average score for Testing and Validation was 95.5. The high score was 97. The low score was 94.

Key Positive: Dedicated Test Environments
Some of the railroads created dedicated test environments with all needed hardware, software, and components to test remediation changes prior to moving the remediated systems into production.

Key Positive: Comprehensive Test Cycles
The railroads designed comprehensive test cycles, which covered baseline, unit, and systems integration testing and multiple cycles for new test scripts, new systems, and specific application dates.

Finding: Final Test by October 30, 1999
All have conducted or are scheduled to conduct by October 30, 1999, final tests critical to customer and safety related activities.

Recommendation:
Final cycles of testing should be completed as soon as possible. Emphasis should be placed on transportation critical systems to ensure business continues successfully into the Year 2000 and beyond.

4.2.7 Documentation

The railroads used formal, comprehensive strategies to document their Y2K remediation efforts. All followed corporate policies to create, control, and retain the documentation. Care was executed to maintain inventories and assessments, as well as those documents tracking the Y2K remediation work activity. The railroads varied in their approach to documentation. Some used only online databases, repositories, templates, and reports. Others placed more emphasis on paper systems, but with computer backup.

The average score for Documentation was 97. The high score was 99. The low score was 95.

Key Positive: Documentation Standards and Process Changes Accessible
The railroads recognized the need to inform employees of documentation standards and of changes in processes. The railroads use a variety of communication means to accomplish this. They posted documentation templates on their Intranets, maintained Y2K hotlines, sent internal email, and published internal newsletters. They used Internet Y2K sites, EDI testing hotlines, and meetings to keep supply chain partners and regulatory agencies informed of changes.

Key Positive: Stringent Quality Assurance Programs
Many of the railroads had stringent quality assurance programs, which included reviewing documentation. One railroad instituted a green team/red team approach that performed post implementation reviews of all critical risk areas. Another railroad hired an independent

consultant who reviewed and certified all documentation and test results, in addition to an appointed internal auditor. The railroads required completion of documentation before certification of testing was granted.

4.2.8 Risk Management and Contingency Planning

Even though all of the railroads believe they are prepared to conduct business as usual as the Year 2000 approaches, they have assessed risks for priority business areas and associated processes, as well as the severity of impact for each area. After assessment, they prepared contingency plans with alternate solutions for business continuity planning. Because the railroads are so far along in the remediation process and have remediated critical systems, they did not include prioritization of any remaining remediation tasks or testing.

The average score for Risk Management and Contingency Planning was 97.25. The high score was 98. The low score was 96.

Key Positive: Command Centers and Contingency Plan in Place
Being proactive, the railroads have set up command centers throughout the country. Plans are in place to increase staffing and provide coverage 24 hours a day for 7 days a week with railroads varying periods of time beginning December 31, 1999, into January 2000. The command centers are modeled after existing help desks, but with additional technical experts and knowledgeable business representatives on hand.

Key Positive: Timely Updates on Y2K Developments
The railroads will keep customers, vendors, and regulatory agencies informed by 800-telephone numbers with periodic status updates, hotlines responding to assistance requests and developments posted on the Internet.

Finding: Contingency Planning Still in Process
Some railroads have not finalized contingency plans.

Recommendation:
Railroads need to finalize contingency plans for dealing with Y2K non-compliant vendors and customers and logistics for operating command centers. Railroads should continue to identify critical suppliers and arrange for backup resources including diesel fuel, power, and telecommunications. In their contingency plans, the railroads should also address EDI with customers who have not tested.

5 CONCLUSION

In conclusion, no organizations whose operations depend as heavily on computers and software as the railroad industry can be absolutely sure there will be no date-related glitches that escaped remediation. Nonetheless, this independent assessment of the due diligence followed by all four of America's largest railroads indicates the American public and all organizations who ship their goods over the rails should expect no degradation of service caused by year 2000 problems.

As of the date of this report, all railroads are continuing their Year 2000 program across the millennium. For the final quarter of 1999, the four major freight railroads are concentrating their efforts on end-to-end testing for additional self-assurance and contingency planning to further minimize risk. In this report and in the railroad-specific assessment reports delivered earlier to each company, the review team encouraged the companies and their Year 2000 project teams to maintain the strong management due diligence they have exercised to date in completing the tasks that remain. These tasks fall primarily into the areas of a) additional (and in many cases, redundant) end-to-end testing, b) testing data interchange with additional suppliers and customers, and c) contingency planning. In each case, the individual railroad is further tightening up what has already been assessed as falling into the *very low risk* area. This is the kind of discipline that can find and eliminate any bugs that may remain and prepare the companies to react effectively and rapidly should any bugs appear.